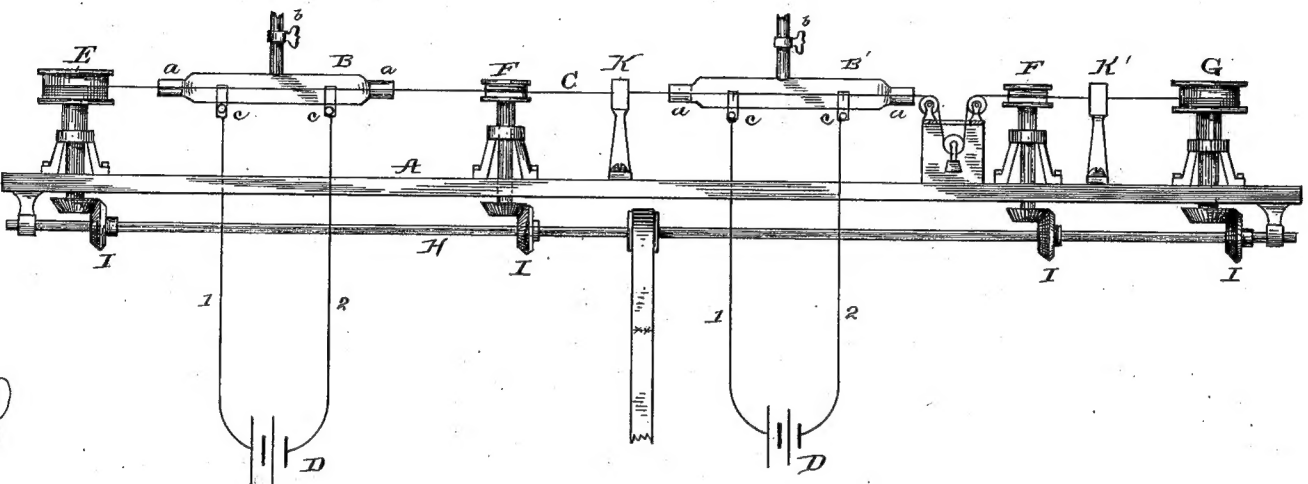


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T. A. EDISON.

Patented July 7, 1896.



Thomas C. Shivers
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New York

THE MORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF AND APPARATUS FOR DRAWING WIRE.

SPECIFICATION forming part of Letters Patent No. 563,462, dated July 7, 1896.

Application filed October 21, 1887. Serial No. 252,965. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Methods of and Apparatus for Drawing Wire, (Case No. 735,) of which the following is a specification.

My invention relates to a continuous process of drawing wire and annealing it between the dies or draw-plates without stopping the operation of drawing, such as is set forth in my prior patents, Nos. 436,968 and 436,969, dated September 23, 1890.

My object is to prevent the oxidation of the wire during the annealing process and the loss of metal due to the oxid, which, if it forms on the wire, has to be removed from it before it enters the dies. I also dispense with the pickling-tubs, through which, in the
20 processes described in the applications referred to, the wire has to be passed to remove the oxid.

My invention is therefore especially adapted to the economical production of exceedingly
25 fine wire, which has heretofore only been made in comparatively short lengths and at great expense.

My invention consists, mainly, in drawing the wire, for the purpose of annealing it, before it reaches a die or draw-plate, through a closed chamber filled with a non-oxidizing gas, such as hydrogen, heating the wire in the presence of a non-oxidizing gas, and subsequently cooling the wire below the oxidizing-point while still surrounded by said gas. The heating and cooling effects are preferably obtained by including a section of the wire within the closed chamber in an electric circuit by means of suitable spring-contacts bearing upon the wire, a sufficient distance being left between the heated section of the wire and the end of the closed chamber to cool the wire below the oxidizing-point before it leaves the chamber.

Apparatus for carrying my invention into effect is illustrated in the accompanying drawing.

The apparatus is shown as placed upon a suitable table or support A.

50 Band B' are the annealing-chambers. They are preferably made of glass and are provided with stuffing-boxes *a a* at their ends

through which the wire C passes. By means of tubes *b*, connected with these chambers, they are filled with hydrogen or other non-oxidizing agent in a gaseous state and under slight pressure. Into each of these chambers a circuit 1 2 extends, terminating in contact-springs *c c*, which are sealed in the glass of the chamber and which bear upon the wire C as it passes through the chamber, so that a portion of the wire within the chamber is included in the circuit. The circuits extend from batteries D or from any suitable source or sources of electricity.

The wire is drawn continuously from a reel E by means of one or more drawing wheels or drums F, and the wire after drawing is taken up by the drum or reel G. All the drums or wheels may be revolved from the same shaft H, which is connected with a source of power, by means of the bevel-gears I.

The wire first passes through the chamber B, where it is heated by the current, but no oxidation occurs, since the chamber is filled with the non-oxidizing gas, and such gas also serves to reduce any oxid which may have formed on the wire while in the air. By the time the wire leaves the chamber it is cooled below an oxidizing temperature by reason of the fact that the wire is locally heated within the chamber by means of the electric current, and after being heated passes for a sufficient distance through the gas to reduce its temperature below the oxidizing-point. It thus reaches the first die or draw-plate K in a softened or annealed condition, but without any oxidation. After passing through this die it enters the chamber B' and is thus annealed again before it reaches the second die K'. These operations of annealing and drawing may be repeated continuously upon the wire as many times as desired to reduce the wire to the required size.

In order to keep the wire taut and take up any slack due to difference in the revolution of the gears, I prefer to provide a weight *d*, suspended from a pulley *e*, under which pulley the wire C passes.

What I claim is—

1. The method of drawing wire consisting in heating the wire in the presence of a non-oxidizing gas, permitting the cooling of the wire below the oxidizing-point while still sur-

rounded by said gas, and afterward passing the wire through a die or draw-plate, substantially as set forth.

2. The method of drawing wire consisting in first heating the wire in the presence of hydrogen, then permitting the cooling of the wire below the oxidizing-point while still surrounded by hydrogen, and then passing the wire through a die or draw-plate, substantially as set forth.

3. The method of drawing wire, consisting in surrounding a section of the wire with a body of non-oxidizing gas, in passing an electric current through a portion of said section, so as to heat only a portion of the wire surrounded by the gas, whereby after being heated the wire will be allowed to cool below the oxidation-point while still surrounded by said gas, and finally in passing the wire through a die or draw-plate, substantially as set forth.

4. The method of drawing wire, consisting in surrounding a section of the wire with a body of hydrogen, in passing an electric current through a portion of said section, so as to heat only a portion of the wire surrounded by the gas, whereby after being heated the wire will be allowed to cool below the oxidation-point while still surrounded by said gas, and finally in passing the wire through a die or draw-plate, substantially as set forth.

5. In apparatus for continuously drawing and annealing wire, the combination of the

air-tight annealing-chambers each provided with a gas-inlet and with circuit-terminals entering the chamber, means within the chamber for connecting said terminals to the moving wire, the dies or draw-plates, and means for drawing the wire through said chambers and dies or draw-plates, substantially as set forth.

6. In apparatus for continuously drawing and annealing wire, the combination with the annealing devices and the dies, of the drawing-wheels for moving the wire and the weight suspended directly from the wire for taking up the slack, substantially as set forth.

7. In an apparatus for continuously drawing and annealing wire, the combination of an air-tight annealing-chamber through which the wire is moved continuously, means for supplying a non-oxidizing gas to said chamber, electric terminals entering said chamber, and including in circuit a portion, only of the moving wire within the chamber, whereby after being heated the wire may be allowed to cool below the oxidation-point while still in said chamber, means for moving the wire through said chamber, and a die or draw-plate, substantially as set forth.

This specification signed and witnessed this 17th day of October, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.